We claim:

2. A receiver for processing an optical signal, comprising:

a photo-detector for converting said optical signal to an electrical signal; and

an equalizer for removing intersymbol interference from said electrical signal, said equalizer having a plurality of coefficients configured to be updated based upon a least-mean $2N^{th}$-order (LMN) algorithm, where N is greater than one.

3. The receiver of claim 1, further comprising a controller to update said coefficients based upon a least-mean $2N^{th}$-order (LMN) algorithm, where N is greater than one.

4. The receiver of claim 2, wherein said equalizer is a finite impulse response filter configured to produce a first output signal responsive to said electrical signal, said first output signal being representative of a sum of the associated electrical signal plus a weighted sum of previous ones of the electrical signal, wherein the previous signals are weighted by said coefficients.

5. The receiver of claim 3, further comprising:

a slicer to produce a predicted signal for each first output signal received from the finite impulse response filter;

a subtractor to produce an error signal proportional to the difference between said first output signal and a corresponding predicted signal or training signal; and

a controller configured to update said coefficients responsive to the error signal.

6. The receiver of claim 4, wherein said slicer is configured to produce the predicted signal by adaptively determining a slicing threshold.

7. The receiver of claim 4, wherein said equalizer is a feed forward equalizer and said controller is configured to update a set of said coefficients $\vec{c}(k+1)$ at a time (k+1) as $\vec{c}(k)+\beta N[e(k)]^{2N-1}\vec{u}(k)$, wherein $\beta$ is a preset step size, $\vec{c}(k)$ and $e(k)$ are respective set of coefficients and error signals at a time k, and $\vec{u}(k)$ is an input signal at the time k.

8. The receiver of claim 1, wherein the equalizer is a digital filter.

9. The receiver of claim 2, wherein the equalizer is an analog filter.

10. The receiver of claim 3, further comprising:

a first subtractor to produce a second output signal, said second output signal being a sum of one of the first output signals and a corresponding feedback signal;

a slicer to produce a predicted signal in response to each second output signal;

a second subtractor to produce an error signal representing a difference between the second output signal and a corresponding training signal or predicted signal;

a feedback filter to produce the feedback signal in response to corresponding ones of the predicted or training signals, the feedback signal being a weighted sum of the predicted or training signal, wherein weights in the sum being characteristics of the filter; and

a controller to update the weights in response to the error signal, the controller configured to perform the updates based upon a least-mean $2N^{th}$-order (LMN) algorithm where N is greater than one.

11. The receiver of claim 9, wherein said equalizer is a decision feedback equalizer and said controller is configured to update a set of the weights $\vec{w}(k+1)$ at a time (k+1) as $\vec{w}(k)+\beta N[e(k)]^{2N-1}\vec{r}(k)$, wherein $\beta$ is a preset step size, $\vec{w}(k)$ and $e(k)$ are respective sets of weight and error signals at a time k, and $\vec{r}^{T}(k)=[\vec{u}(k),-\vec{a}(k)]$, where $\vec{u}(k)$ is an input signal at the time k, and $\vec{a}(k)$ is a predicted or training signal at the time k.

12. A receiver for processing an optical signal, comprising:

a photo-detector for converting said optical signal to an electrical signal;

an equalizer for removing intersymbol interference from said electrical signal; and

a slicer to produce a predicted signal in response to each input signal based upon a slicing threshold, wherein said slicing threshold is varied based upon a signal distribution of said electrical signal.

13. The receiver of claim 11, further comprising a threshold control algorithm to track said signal distribution of said electrical signal and adjust said slicing threshold for a reduced bit error rate of said predicted signal.

14. The receiver of claim 12, wherein said threshold control algorithm accumulates said signal distribution information within a window of finite duration to allow tracking of slowly varying non-stationary channels.

15. A method for processing an optical signal, comprising the steps of:

converting said optical signal to an electrical signal;

removing intersymbol interference from said electrical signal using an equalizer, wherein said equalizer has a plurality of coefficients; and

updating said plurality of coefficients based upon a least-mean $2N^{th}$-order (LMN) algorithm where N is greater than one.

16. The method of claim 14, wherein said equalizer is a finite impulse response filter that is further configured to produce a first output signal responsive to said electrical signal, said first output signal being representative of a sum of the associated electrical signal plus a weighted sum of previous ones of the electrical signal, wherein the previous signals are weighted by said coefficients.

17. The method of claim 15, further comprising the steps of:

producing a predicted signal for each first output signal received from the finite impulse response filter;

producing an error signal proportional to the difference between said first output signal and a corresponding predicted signal or training signal; and

updating said coefficients responsive to the error signal.

18. The method of claim 16, further comprising the step of updating a set of the coefficients $\vec{c}(k+1)$ at a time (k+1) as $\vec{c}(k)+\beta N[e(k)]^{2N-1}\vec{u}(k)$, wherein $\beta$ is a preset step size, $\vec{c}(k)$ and $e(k)$ are respective set of coefficients and error signals at a time k, and $\vec{u}(k)$ is an input signal at the time k.

19. The method of claim 15, further comprising the steps of:

producing a second output signal, said second output signal being a sum of one of the first output signals and a corresponding feedback signal;

producing a predicted signal in response to each second output signal;

producing an error signal representing a difference between the second output signal and a corresponding training signal or predicted signal;

producing the feedback signal in response to corresponding ones of the predicted or training signals, the feedback signal being a weighted sum of the predicted or training signal, wherein weights in the sum being characteristics of the filter; and

updating the weights in response to the error signal, the controller configured to perform the updates based upon a least-mean $2N^{th}$-order (LMN) algorithm where N is greater than one.

20. The method of claim 18, further comprising the step of updating a set of the weights $\vec{w}(k+1)$ at a time (k+1) as $\vec{w}(k)+\beta N[e(k)]^{2N-1}\vec{r}(k)$, wherein $\beta$ is a preset step size, $\vec{w}(k)$ and $e(k)$ are respective sets of weight and error signals at a time k, and $\vec{r}^{T}(k)=[\vec{u}(k),-\vec{a}(k)]$, where $\vec{u}(k)$ is an input signal at the time k, and $\vec{a}(k)$ is a predicted or training signal at the time k.

21. A method for processing an optical signal, comprising the steps of:

converting said optical signal to an electrical signal;

removing intersymbol interference from said electrical signal;

producing a predicted signal in response to each input signal based upon a slicing threshold; and

varying said slicing threshold based upon a signal distribution of said electrical signal.

22. The method of claim 20, further comprising the steps of tracking said signal distribution of said electrical signal and adjusting said slicing threshold for a reduced bit error rate of said predicted signal.

23. The method of claim 21, further comprising the steps of accumulating said signal distribution information within a window of finite duration to allow tracking of slowly varying non-stationary channels.